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Equity, Efficiency and Sustainability in Water Allocation in the Andes: Trade-offs in a Full World

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ABSTRACT: Conflicts between water users are increasing, making evident the lack of a judicious, balanced and transparent procedure for water allocation. This is particularly apparent in regions where demand comes from users with a wide range of needs and different levels of power, and where human appropriation of water is reaching unsustainable levels. Allocation mechanisms with varying degrees of governmental intervention exist in Colombia, Ecuador and Peru, and they reflect the priorities that these societies give to relevant normative principles governing water: equity, efficiency and sustainability. Water laws in these three countries indicate that 1) while efficiency has become the bastion of neo-liberalisation, equity and sustainability principles are either neglected or become subsidiary, 2) implicit definitions of equity fall short in promoting the interests of the disadvantaged, and 3) the complex definition, measurement and monitoring of what constitutes a sustainable scale of human water use, make it an impractical goal. Achieving a balance between equity, efficiency and sustainability appears unrealistic, suggesting the need to remove efficiency as a principle in water allocation and make it an important but subsidiary tool to equity and sustainability.

KEYWORDS: Water allocation, equity, efficiency, scale, sustainability, comparative law, Andes

INTRODUCTION

Water allocation refers to the rules and procedures through which access to water is decided for individual or collective use, and in relation to availability. Once water becomes seasonally scarce in response to higher demand and increasing variability of precipitation, water allocation rules and procedures become more important as mechanisms to prevent conflict. The complexity of the water allocation task and the increasing pressure on water (increasing demand and variability) have stimulated the revision of water allocation goals and means in many countries. Allocation mechanisms with varying degrees of governmental intervention exist in the Andean region including water rights, licences or concessions, and they reflect the priorities that these societies give to relevant normative principles governing water: equity, efficiency and sustainability.

The distrust in the market as the 'best' mechanism to allocate water among competing users seems to indicate that economic efficiency is not the main goal of Andean societies. But then, what are the active mechanisms for water allocation? What do laws tell us about the values and guiding principles that these societies have chosen to allocate water? The underlying question is how countries are dealing with the trade-offs and potential complementarities between equity, efficiency and sustainability in water allocation. As stated by Adger et al. (2005) the relative weight allocated to each criterion is not given but rather emerges from societal processes of consent and action; the balance between them is dynamic as they are promoted or contested by societies.

Government policies consistently state that resources will be allocated *with equity* but what constitutes equity is highly unclear (Syme et al., 1999). In many countries including the Andean ones, equity goals are often stated as a priority in water policies, even if undefined. In practice, markets and

efficiency considerations persist, skewing allocation in favour of those who have the ability and means to use water to produce the greatest economic returns, thus trading off equity against efficiency goals (Mehta, 2006). Equity can also be used "to cloak self-interest" (Syme et al., 1999: 52) or it can be promoted as an instrument for economic growth and development (World Bank, 2006). Thus the explicit or implicit definition of equity in water allocation significantly impacts outcomes in water access by users with diverse levels of power and water needs. Moreover, the compliance of national water policies with the international water governance agenda has implied the technification, universalisation and depoliticisation of water allocation (Boelens and Seeman, 2014; Joy et al., 2014; Perreault, 2014). Consequently, guiding principles of water allocation (equity, efficiency and sustainability) have been assumed to equally benefit all members of society when, in practice, these concepts are far from being neutral.

The trade-offs between equity, efficiency and sustainability have been well documented in the literature, particularly the trade-offs between equity and efficiency. Some authors (Mehta, 2006; Wegerich, 2007; Ingram et al., 2008; Araral, 2010; Achterhuis et al., 2010; Zwarteveen and Boelens, 2014) have described how efficiency tends to be a preferred goal for the allocation of water, particularly in situations where participation in decision making (procedural justice) is ignored. The goal of a limited scale of the economy relative to the physical limits of resources is consistently referred to as the goal of sustainability, and its relationships with equity and efficiency have been addressed to a lesser extent.

Assuming the Western centric definition of human development as the capability of individuals to be and do what they want, inequality in human development has a causal relation with sustainability in both directions. More inequality will lead to more unsustainability and vice versa (Neumayer, 2011). The connection between the three goals has been addressed by ecological economists like Daly (1991, 1992), Daly and Farley (2004), Lawn (2004, 2007) and Malghan (2010). They have recognised and described the relationship between these goals and the need for policies that are aware of such a relationship. Malghan (2010) states that when inequality is high, efficiency is high, leading to an increase in the size of the economy due to the rebound effect that drives up consumption with increasing efficiency. This interconnection between equity, efficiency and sustainability is manifested very clearly in the increasing extension of conflicts over insufficient or degraded water (sustainability), bringing to the forefront the notions of fairness, equity and justice to counterbalance the dominant socio-political notions of efficiency and markets that have been predominant in the early 21st century (Ingram et al., 2008).

The goal of this paper is to show: 1) the balance between these principles in the water laws of three Andean countries (Colombia, Ecuador and Peru) to highlight the contentious situation across the region; 2) the relative imbalance between the multiple and diverse forms of efficiency found in water laws in contrast to the limited forms of equity and sustainability; and 3) the need to eradicate efficiency as a principle of allocation, to make it a subsidiary tool of sustainability and equity. The case of Colombia shows the concentration of decision-making power in environmental authorities, but with equity tools outside of the water legal framework; Ecuador has an ambitious focus on equity and redistribution goals, which are still at a theoretical level; and Peru has a marked orientation towards efficiency goals, particularly economic.

DEFINITIONS

The terms equity, efficiency and sustainability (or scale) are rarely defined in laws and regulations. In this section I summarise relevant literature about the scope of the terms in order to provide elements for the analysis of water laws in the Andes.

Sustainability refers to the proportional relationship between the physical size of the economy and the ecosystem that contains and sustains it (Malghan, 2010). The goal of keeping the economic system

within sustainable limits requires that water is used and allocated in amounts such that the sources and sinks of water remain within their regenerative capacity in order to maintain ecosystems and their functions. In this context the goals of scale and sustainability are interchangeable.

The notion of efficiency for water resources has had two main interpretations: technical and allocative. Technical efficiency has evolved to have a capped and an uncapped meaning. Initially efficiency was used as an accounting principle comparing what went into a machine or process with what came out, measuring what was conserved. For water distribution systems, efficiency is measured by comparing the water that is delivered to the final users with the water that is treated or lost in the distribution system. In this sense, efficiency has a ceiling and therefore it is used in the capped sense.

In the last two centuries the term efficiency has migrated to biology, economics and business management to incorporate the meaning of potential for growth and creation (Alexander, 2008). Thus efficiency is called conservation when it refers to natural resources or energy use; it is called productivity in the context of economic growth or industry, or economies of scale when referring to production (Princen, 2005: 73). In water use, technical efficiency has recently been interpreted in the sense of increasing outputs for each drop of water, where there is no limit to conservation, productivity, or income generation (thus uncapped). Consequently, 'scaling-up' and thus continuous growth (unsustainability) is intimately tied to our definition of efficiency (Malghan, 2012).

Allocative efficiency is a term of neoclassical economics that has been applied to water as it becomes a scarce resource for competing users. Maximum allocative efficiency is reached when the scarce resource generates the most monetary value (as a measure of utility); this is achieved through the Pareto principle which defines optimal allocation as the one where no one can be made better off without making someone else worse off (Dinar et al., 1997). Pareto efficiency assumes that goods, products or resources have the same utility for everyone (monetary value), disregards unequal distribution of wealth and ignores the diminishing marginal utilities of wealth (Daly and Farley, 2004).

Equity, equality and need are concepts at the core of struggles of societies for social justice (Jost and Kay, 2010). For the allocation of scarce resources, distributive and procedural justice offer useful perspectives. Distributive justice addresses issues of fairness especially equity considerations; and procedural justice addresses the decision-making rules used to determine distribution outcomes (Jost and Kay, 2010). In the realm of distributive justice, for priority resources such as water it has been found that societies prioritise justice considerations over any other criteria such as efficiency (Matania and Yaniv, 2007).

General debates have made distinctions between equity, equality and need as guiding principles for allocation (Lerner, 1977). The concept of equity is associated with the proportionality (direct or inverse) between inputs and outcomes justifying the unequal allocation of resources based on merit (allocating more to those who contribute more) or historical injustice (allocating more to those who have been historically penalised with limited access); while equality is associated with outcomes being distributed equally among group members. One of the most basic forms of inequalities exists between those who have a say in decision making and those who do not (Neumayer, 2011), making procedural factors of justice at least as important as distributive factors (Tyler and Smith, 1998). Participation in the definition of decision-making processes as well as in the decision itself is a key component of procedural justice (Jost and Kay, 2010).

Legitimacy as defined by Adger et al. (2005) or procedural justice as defined by Syme et al. (1999) are understood as the extent to which decisions are acceptable to participants and nonparticipants who are affected by those decisions, the hypothesis being that if procedural justice is demonstrated, the outcome is more likely to be accepted (Syme et al., 1999). There are no universal rules or procedures that guarantee the legitimacy of policies because cultural expectations and interpretations define what is or is not legitimate (Brown et al., 2002); but the perceived fairness of policies involving resource allocation is a powerful determinant of their legitimacy (Rasinsky, 1987; Zelditch, 2001).

As a vital irreplaceable resource, water is seen as a resource that should be allocated more equitably than efficiently, in contrast with other resources such as foods, transport, communication, for which people tend to be more willing to accept efficiency considerations and hence unequal (discriminatory) allocations (Rasinsky, 1987; Zelditch, 2001). But concepts such as efficiency, utility maximisation, individual choice and private property rights have become key terms used to legitimise interventions to modernise water management institutions (Achterhuis et al., 2010). In the context of Latin America the balance between equity and efficiency is of critical importance since recent water policies and reforms are perceived as prioritising efficiency over equitable allocation (Ahlers, 2005; Achterhuis, et al., 2010) and have increasingly led to conflicts as water use reaches the limits of available water resources.

WATER ALLOCATION IN THE ANDEAN REGION

The purpose of this section is to present the current rules for the allocation of water in Colombia, Ecuador and Peru, and analyse them in relation to the balance between the three principles (equity, efficiency and sustainability). In Colombia, despite extensive legislation that seems to balance the three principles, the government maintains total control over water allocation rules and decisions; Ecuador is using progressive notions of equity and sustainability but lacks implementation capacity; and Peru has taken a strong stance for efficiency at the expense of the other two principles. One indicator of the balance between these principles is the use of the terms in the text of the constitution and water laws as shown in Table 1. The emphasis on efficiency versus equity and sustainability is remarkable particularly in Colombia and Peru. The Ecuadorian constitution presents a more balanced perspective, but I will show in this section that this balance has not been translated into enforceable rules.

Table 1. Frequency of the use of the terms in constitutions and water laws.

<i>Constitution</i>	Colombia 1991	Ecuador 2008	Peru 1993
Equity	12	33	0
Equality	10	41	6
Efficiency	12	21	2
Sustainability	1	12	4
<i>Water codes</i>	Colombia 1974/78/97/2002	Ecuador 1972	Peru 2009/10
Equity	1	1	0
Equality	0	0	0
Efficiency	22	5	106
Sustainability	7	0	55

Colombia

Inspired by the 1972 Stockholm United Nations conference on the human environment, Colombia approved the code of natural resources in 1974 (Rodríguez-Becerra, 2009) whose aim is to preserve and restore the environment and renewable resources according to criteria of equity, permanent availability of resources and maximum social participation. Despite these creditable goals, the subsequent norms have not ascribed to them and have maintained the discretion of the state in decision making. At least eight laws or decrees directly regulate water, watersheds or water utilities resulting in a fragmented water legislation.

The water code (decree 1541 of 1978) states its objective of compliance with the goals of the code of natural resources, implicitly recognising the linkages between inequality and the scale of use of

natural resources. The water code regulates the intervention of the state in the allocation of water through the combined mechanisms of concessions and water use fees. The state intervenes in the approval or rejection of water concessions (state regulation for prioritised allocation and for maintaining water use within the capacity of ecosystems) and once granted, water is subject to a use fee (state regulation for market efficiency and environmental protection). The water code incorporates aspects related to a non-explicit notion of distributive equity, economic efficiency and sustainability. In terms of equity the code established an order of priority for water allocation starting with human needs, followed by agriculture, hydroelectricity industry or manufacturing, mining and recreation (Art. 41); it also established that domestic use will always have priority over other uses, collective uses over individual and the population of the region over the external (Art. 43). Even though the prioritisation of water allocation is done with an intention of ensuring that economic activities do not interfere with the satisfaction of human needs, the lack of practical mechanisms of enforcement and oversight (Uribe Botero, 2005) prevents the link between this prioritisation and the pursuit of equity.

One fundamental problem with water allocation and use under Colombian law is that concessions are subject to loose standards for their approval or renewal. Concessions are the responsibility of CARs (Corporaciones Autónomas Regionales) which are regional environmental authorities responsible for granting water concessions, water licences and the approval of environment management plans, and for control and monitoring of the quality and quantity of wastewater disposal. These authorities have discretion for approving, renewing, changing or cancelling concessions based on conditions that are not clearly defined (MacDonnell and Grigg, 2007). When several users of different sectors request concessions over the same water, they are granted through a discretionary decision of the government official.

It is estimated that 70% of small users do not hold a water concession (Uribe-Botero, 2005). This may be due to the cumbersome nature of the application process and the limited benefit that small users (e.g. small water distribution systems) perceive from holding a water right. However, as conflicts appear or increase, communities believe that a concession would provide the legal backing for reliable access to water and several regional environmental authorities have started to receive more applications from small rural organisations (Riascos, 2012). But given the significant number of requisites for the application process, including stream flow measurements in wet and dry seasons, concessions are largely accessed by water users with enough resources to gather all the required documentation since the CARs have limited resources (human and technological) and limited enforcement capacity (Uribe-Botero, 2005). Additionally, the concession process is one of administrative allocation (largely reviewed on a first come, first served basis) (MacDonnell and Grigg, 2007) which means that some applicants have to wait for up to eight years before they are granted a water right.

There are other attributes of concessions that make them an unreliable tool for equitable water allocation. In some watersheds the sum of concessions granted is above the capacity of the source (Uribe-Botero, 2005; Riascos 2012). Art. 37 of the water code established that the state is not responsible for providing the amount of water that is granted through concessions due to natural fluctuations in availability; that there is no chronological priority in the concessions granted; and that shortfall caused by drought, pollution, natural disasters or any other causes are to be managed by administrative regulation either on a pro-rata or other undefined basis (MacDonnell and Grigg, 2007).

Since concessions are linked to a payment, they are seen primarily as an administrative mechanism that collects resources for water source protection in line with the land use plan of the watershed (Law 812 of 2004, art. 89) more than as an instrument to solve equity issues or for maximising the benefits of water use for society. The mechanisms created in the Code of Natural Resources to charge water users and water polluters were designed and approved quite early (1974) in relation to other countries in the region. The ministry of the environment only regulated tariffs (decree 155 of 2004) more than 10 years after they were approved in Law 99 of 1993. Currently, the tariff paid for water is less than 1 Colombian

peso per cubic meter of water (around US\$0.00053/m³) used or granted (with uses different from domestic being slightly higher). These low rates make the instrument ineffective in encouraging efficient use (Rudas, 2009). Concession holders focus on requesting large concessions at little additional cost instead of focusing on reducing leakages or other sources of inefficiency (Rudas, 2010).

The concept of efficiency is used repeatedly in the norms which stipulate that management of natural resources (decree 2811 of 1974) in general and water (decree 1541 of 1978) in particular will strive for an efficient use, compatible with their conservation and the collective interest (Art. 45 decree 2811 of 1974). Even if efficiency is not defined, it is apparent that the emphasis is on technical efficiency as required by law 373 of 1997 that established that the amount of water dedicated to any individual activity should not exceed the necessary amount to achieve the purpose of that activity, and that large water users (urban purveyors, irrigation, drainage and hydroelectric projects) should design a programme of efficient use of water. This programme must be approved by the granting authority which has discretion to decide the level or type of efficiency that is acceptable (MacDonnell and Grigg, 2007).

Despite the intentions of the code of natural resources to provide maximum participation in the management of renewable resources, participation in the allocation of water is limited to the possibility to oppose the granting of a concession being considered for approval (Art. 60 of the water code). More recently, the Colombian government created the watershed management and planning process (POMCAs), defined by decree 1729 of 2002 with the purpose of establishing or restoring the balance between the economic use of renewable resources and the biophysical conservation of watersheds. The POMCAs are formulated and approved by environmental authorities, and they identify and locate the areas where it is necessary to preserve the ecosystem, change land use and/or construct infrastructure for the sustainable use of natural resources. Based on the results of the POMCA, the environmental authorities can modify granted permits (water use and pollution) as well as submit environmental restrictions for land use to municipal authorities, since POMCAs have primacy over other decisions related to renewable resources. In practice, POMCAs are a limited instrument of participation precisely because all the decision-making responsibility was granted to CARs. As a consequence the participation of affected water users can be restricted to the initial phases (diagnosis, prospective, formulation) before decisions are made, and key players such as municipal governments and large corporations do not feel the need to participate since they can influence the decisions in the latter stages of the process (Bastidas, 2009).

Addressing sustainability concerns, Colombia included water reserves (Art. 118 and 119) and the declaration of water source closure (Art. 121) in the water code of 1978. Reserves can be created for the development of a public utility, future development by the government, programmes of restoration, conservation or preservation of the quality or quantity of water or its associated environment, to develop aquaculture programmes or protect fish or flora habitats. Streams can be declared closed when the total of concessions granted reach or exceed the available water flow. Decisions on stream closure are based on the water scarcity index and ecological flows, tools that have been defined by the National Institute of Meteorology, Hydrology and Natural Resources (IDEAM) and that should be applied by CARs. Under reserves or closed basins no water concessions or authorisations may be issued. Although the intention of these articles is to limit the use of water below unsustainable rates, they have a limited applicability due to the lack of coordination with municipal planning authorities that independently of environmental authorities have the power to authorise development projects or do not have the capacity to prevent irregular urban growth. Once new developments are built, water organisations are obliged to provide water services, pushing water use above sustainable rates.

The excessive state power to allocate water was challenged in 2009 through a referendum promoted by some 60 civil society organisations. The referendum proposed among other things, that the state should support the more than 12,000 community organisations providing water services in

rural and peri-urban areas. The law of public utilities (Law 142 of 1994) established that under the principle of equity poor households would receive a water tariff subsidy administered by the water provider; but the same law made the concession a requisite for community organisations to be eligible for state subsidies and therefore currently less than 15% of community water providers in the country receive subsidies (Roa-García and Pulido-Rozo, in press). Despite the significant support of people across the country, the referendum did not have the required endorsement by Congress and failed to materialise a shift towards a more equitable access to water (Harris and Roa-García, 2013). What this referendum did however was to initiate a re-politicisation of water allocation principles and catalysed dozens of local initiatives of environmental protection and the defence of common goods (Roa-Avendaño and Rodríguez, 2011).

More than the specific referendum for water, the writ of protection of constitutional rights (*tutela*) incorporated in the 1991 constitution has resulted in unprecedented decisions by the constitutional court to protect people and communities' access to water in defence of the equity and precautionary principle, directly connected to sustainability (Roa-García et al., in press). It is recognised that the constitutional court's decisions on a case-by-case basis do not represent a change in the legal framework for water, but the defence of the human right to water, even if not explicitly incorporated in the constitution, and the respect for minority communities being impacted by development projects, have set an exceptional precedent in the Andean region.

Within Colombia, the three goals of equity, efficiency and sustainability have been given to regional environmental authorities, CARs. They are responsible for granting water concessions, determining efficiency caps, approving efficiency programmes for large water users, enforcing stream closure, and making final decisions about watershed management and planning. In regions where hydroelectric dams are present, CARs have excessive economic power which has corrupted their governance and perpetuated their seizure by private corporate interests, political leaders and NGOs (Canal Albán and Rodríguez Becerra, 2008). Against the abuse of centralised decision making, the inclusion of water as a social right plus instruments of social participation in the constitution of 1991 have allowed people and communities to appropriate legal instruments and institutions such as the constitutional court to defend their right to water.

Ecuador

The predominance of water in the Ecuadorian constitution was the response to more than 20 years of water policies that had had profound implications for the accumulation of land and water at the expense of peasant and indigenous groups. The process that led to the new constitution originated in the reduction of the role of the state during the 1980s and 1990s that was evident in the maintenance of a poorly funded national organisation in charge of water governance, the water resources national council (CNRH – Consejo Nacional de Recursos Hídricos) which had limited authority and power to formulate policies. In the absence of a central water authority, decentralised state agencies, NGOs and organised water users started developing local solutions (Hoogesteger, 2011) and created a wider base of engaged civil society, especially in the Andean region of the country (Boelens et al., 2010). Social movements, based on the needs and experience of these grassroots organizations, were a critical force in the struggle to reform the constitution towards principles of equity and inclusion.

Prior to the constitution of 2008 the diverse legislation for water had allowed varied interpretations and confusion producing *de facto* ownership of water by individuals and corporations. The multiple norms and regulations had created a myriad of conflicting institutions which fragmented responsibilities to regulate and control water use for individual economic sectors. The discretionary power of these institutions for administrative decisions such as permits, authorisations, licences or concessions produced a permanent failure to comply with the water law of 1972, which established priorities for allocation according to uses and users. The agrarian reform of 1997 legalised the

possibility of automatic transfer of water rights with the transfer of land, which led to the concentration of water parallel to the concentration of land. The result of this trend was that the small farmers producing most of the food for national consumption, corresponding to 86% of total water users had access to 13% of available water while large landowners who represent 1% of agricultural units concentrate on 64% of the resource (Gaybor et al., 2008). The water law of 1972 determined that water concessions for economic activities were granted for a limited period of time, contrary to the concessions for domestic use, which were granted for an indeterminate period. In 1996, through the creation of the CNRH, the state overrode the law by establishing that water concessions for irrigation would also be granted for indeterminate periods of time (Gaybor, 2011). In practice this meant the privatization of water rights. As stated by Terán (2005) Ecuadorian laws have been used by economic and political elites to impose their agendas over a debilitated civil society.

In reaction to this reality, the Ecuadorian constitution of 2008 established the human right to water and the rights of nature; declared water a strategic national patrimony for the public good; explicitly prohibited its privatisation; established that water management is the responsibility of public and community organisations and that public services of water, sanitation and irrigation can only be supplied by public and community agencies responding to principles of universality, uniformity, efficiency, accessibility, regularity, continuity and quality. The priorities for water allocation are formulated in the following order: domestic use, irrigation for food sovereignty, ecological flows, and productive activities. The constitution also established that people should be involved in the design, approval, evaluation and control of public policies related to water. The goal of collective well-being (*buen vivir*) is stated in the new constitution as the goal of development, and the constitutional mandates related to water represent a conceptual break with previous conceptions of development (Escobar, 2010).

The enormous difficulties to translate the goals of the constitution into effective policies have been widely recognised. The state was given a period of one year after the new constitution was officially published in October 2008, to approve a number of laws including the new water law that would integrate the mandates of the constitution. But after almost five years, the law is still being debated. The ten versions drafted in these years have responded to the chronological participation of different interest groups (García, 2010). Correa's government has taken the lead in the negotiations between interest groups and has avoided discussing critical points with social organisations such as the institutions for water governance, the productive uses of water particularly bottled water, the use of hot springs and the devolution of INTERAGUA (the only private water company providing water to the city of Guayaquil) to public administration as mandated by the constitution. The other critical transitory article of the constitution that has not been complied with, instructed the revision and reassignment of all concessions granted for irrigation within the two years following the constitution, to guarantee equitable access and distribution with particular attention to small and medium-size agricultural producers. This was perhaps the clearest attempt to reverse the effects of the inequitable allocation of water under the water law of 1972 and the more than 30 legal norms that supersede and contradict this law.

The constitutional mandate of the reallocation of water is, clearly, in conflict with the interests of the current government in developing the mining sector. The plan for the expansion of extractive industries, to compensate for the reduction of income from oil, is considered contrary to the constitutional mandates of prioritising life and food sovereignty, and a threat to the ecological base of other economic sectors that could be the source of sustainable well-being such as small-scale agriculture and tourism (Sacher and Acosta, 2012). Sacher and Acosta recognise the progress made in the management of mining concessions, but they link the involvement of multinational corporations in large-scale mining projects to the well-known degradation of landscapes and water sources, destruction of the material base of local economies, and the irreversible redefinition of power and social structures, all of them incompatible with constitutional goals.

The bottom-up process that led to the constitutional reform and the uprising of indigenous groups in Ecuador 20 years ago have shifted the power balance and strengthened social movements that have mobilised on multiple occasions after the approval of the mining law in 2009, the development plan of the mining sector 2010-2015 and the granting of large mining concessions to multinational corporations in vulnerable regions where water sources are critical for indigenous and peasant communities. These movements have been repressed (Aguilar Andrade, 2010; Chicaiza, 2010; Sacher and Acosta, 2012), and Ecuador appears as the Latin American country where the largest number of social protests have been criminalised, with more than 200 indigenous and peasant leaders prosecuted for terrorism and sabotage in the last few years (OCMAL, 2011). Additionally, the constitutional court, in response to a call for unconstitutionality of the mining law made by the Confederation of Indigenous Nations of Ecuador (CONAIE) ruled in favour of the mining law (Chicaiza, 2010). The court recognised that the law had been irregularly approved since it did not comply with the required consultation to indigenous nationalities, but endorsed the law with three arguments: the urgency of the law; the e-mail sent by the ministry of non-renewable resources inviting CONAIE to comment on the law (taken by the court as a formal consultation); and the application of a principle previously approved by the national assembly that determines that in case of doubt about the constitutionality of the laws, they should be solved according to the opinion of the assembly (Chicaiza, 2010). This last argument has been found particularly biased since it undermined the hierarchy of the constitution and demonstrated the lack of independence of the constitutional court.

Positive views from analysts about the Ecuadorian water reform process come from the re-establishment of a unique water authority, the national secretariat of water (SENAGUA – Secretaría Nacional de Agua) with the responsibility to coordinate and administer water management in Ecuador, with an independent budget and at the same hierarchical level of ministries. Since its creation in May 2008 SENAGUA has concentrated on the more than 40,000 cases of unresolved requests for water permits or water conflicts; the establishment of regional offices partnering with local institutions within specific territories; and on contributing to the formulation of the new water law (Hoogesteger, 2010). The greatest task of SENAGUA however concentrates on confronting the power of large water users that either do not hold a concession, hold concessions but do not pay the associated tariff, or use tariffs as an exclusionary mechanism to prevent poorer users from accessing water. It is calculated that in the production of bananas and sugar cane, two of the major export crops of the country, 69 and 30%, respectively, of the land under irrigation is not associated with a water concession (Gaybor et al., 2008). The tariff charged annually for concessions averages US\$1.85 per l/s but the government receives less than 7% of what it should receive according to the existing 64,000 concessions in Ecuador (Gaybor, 2011). Tariffs determined autonomously by municipalities with equity goals in mind have failed. Some municipalities based their tariffs on a cross-subsidy scheme according to the type of production and the amount of water use, to benefit small water users and charge more per concession to large, more affluent agricultural producers. This however had the opposite effect, as municipal employees subsequently prioritised the physical distribution of water to those who made the larger monetary contributions (Hidalgo, in press).

Ecuador has incorporated innovative ideas in relation to the goal of maintaining a sustainable scale of human appropriation of water into its legal framework. The constitution of 2008 includes the principle of good living (*buen vivir*) under which the state guarantees development within the regenerative capacity of ecosystems. The constitution also makes the state responsible for planning and management of water in the following order of priority: 1) human use; 2) food sovereignty; and 3) ecological flows. Significantly, Ecuador was the first country to incorporate in its constitution the rights of nature, stating that nature has the right to exist, maintain and regenerate its cycles, structure, functions and processes in evolution, and that every person, community or nationality is able to demand the recognitions of these rights before public organisms (Art. 71). It also declares that nature

has a right to restoration (Art. 72). Despite the intent of these innovations to prioritise equity and sustainability, they remain aspirational.

Peru

The regulation of the water sector in Peru clearly favours efficiency over equity or sustainability. The term *equity* is not used in the text of the water law (Law of Water Resources No. 29338 approved in March 2009) or the regulations of the law (approved by supreme decree No. 001-2C 10-AG in January, 2010). In turn, the term *efficiency* or *efficient* is used 34 times in the text of the law and 72 times in the text of the regulations. This obvious unbalance in the national legal administration of water has left traditionally marginalised communities defenceless when confronted by large commercial water users. Multiple cases have been reported in the literature describing the tension between the Peruvian law that established how water users should be organised and formally solicit water licences, and the Andean communities that perpetually challenge state control over water sources and refuse to comply with the state's regulations (Urteaga, 2006; de Vos et al., 2006; Boelens, 2009; Guevara-Gil, 2010; Boelens et al., 2011; Bueno de Mezquita, 2011; Verzijl, 2011; Sosa and Zwarteveen, 2011; Panfichi and Coronel, 2011).

The term *equity* is used only in article 94 of the regulations (supreme decree 09-95) of the general law of water and sanitation (Law No. 26338 of July 1994) that states that water and sanitation tariffs should be established in line with the principles of: 1) Economic efficiency – tariffs should induce the allocation of resources that maximises the benefits for society; 2) Financial viability – tariffs should aim at recovering the costs of an efficient operation according to the levels of quality and service defined by the National Superintendence of Sanitation Services – SUNASS; 3) Social equity – the state will implement a policy to allow access to the service to the largest number of people; 4) Simplicity – tariffs will be easy to understand, apply and control; and 5) Transparency – the tariff system will be made public. In this text, equity is defined in utilitarian terms (maximising greatest utility for the greatest number of people), an approach that has been criticised on ethical grounds as it can impose a great burden on the few in order to provide benefits to the majority, and also distant from guaranteeing universal access to a basic amount for all.

The 2009 water law in Peru introduces a mechanism that clearly favours water users who can make improvements in efficiency at the expense of water users who cannot. In Art. 55 the law states that within the same productive use, the priority for water allocation will be for the largest public interest, understanding this as: 1) the highest efficiency; 2) the highest income generator; and 3) the producer of least environmental impact. With this definition of the public interest, the law puts efficiency above equity and puts less affluent farmers in clear disadvantage in relation to larger farmers who can make investments in efficiency improvements.

The law created efficiency certificates that would only be granted to water users who could demonstrate improvements in water use efficiency. Two provisions were made by the law and the regulations of the law in which implicit or explicit priority is given in the allocation of water to efficient users. The first one is article 55 which stipulates that water users who hold a certificate of efficiency have priority in the allocation of new water rights over the water that has been saved by the efficiency improvements (explicit). The second provision is chapters 9 and 10 of the regulations of the law that require all operators to comply with efficiency parameters determined by the national water authority in order to obtain efficiency certificates; although the regulations do not explicitly state what happens in the event of poor compliance with the efficiency parameters, the lack of clarity generates the doubt about the meaning that these certificates could have in terms of allocating licences. This creates an incentive to big farmers or water and sanitation organisations to invest in water use efficiency at the expense of farmers or water boards that do not have the financial resources to improve their irrigation or distribution systems.

The new water law of Peru perpetuates the oversight of the diversity of systems of water allocation by the state and its application is increasing unequal access to water. The new water law requires communities to request the formalisation of their water right, using bloc licences (*licencias en bloque*) (Art. 91 of supreme decree No. 001-2C 10-AG). These licences require that the organisation that requests the water licence registers individual water users who are part of the bloc, allocating fixed amounts of water to each of the bloc members (Art. 78 of supreme decree No. 001-2C 10-AG). These licences have to be requested from the local water authority (ALA). If the water rights are not registered, they do not exist for the authority and they can be allocated to other formal and registered water users who request a licence, becoming a mechanism of plunder of water from communities that have managed their water collectively for centuries and have no interest in partitioning water rights to individuals (Urteaga, 2011; Vera-Delgado and Vincent, 2013).¹

By homogenising water allocation mechanisms among radically different types of water users, the law is an instrument of accumulation of water rights and a legal instrument of limited legitimacy. As described by Urteaga (2011), many communities in Peru were not consulted for the design and formulation of the law, which is required by Agreement 169 of the International Labour Organization – ILO and the Declaration on the Rights of Indigenous Peoples (UNDRIP) and which would have contributed to the legitimacy of the law by incorporating procedural justice.

The variable legitimacy of the Peruvian water law and norms is reflected in the degrees of their effectiveness in the main three regions of the country. The coast is the region where national norms and regulations are more obeyed and enforced. The Sierra and the Amazon are regions where traditional forms of water organisations are still widespread, and where enforcement is reduced. One clear example of this situation is the effectiveness of an instrument to plan and forecast agricultural production that was introduced with the initial water law of 1969. This instrument was called the plan of agriculture and irrigation (PCR – *plan de cultivo y riego*) and was designed to facilitate water allocation in the agriculture sector. The use of this tool has been partial (mainly in the northern coastal region) and it is still in use since the new instrument for water allocation announced in the water law of 2009 has not been designed as yet. The original use of the PCR was to allocate water to crops that the government wanted to promote; the PCR has mainly responded to profitability and less to water efficiency of individual crops. Operationally, each farmer presents a plan of production for a chosen crop, and all the demands are compared to the forecasted water availability at 75% of reliability, and approved or adjusted proportionally. In recent years, there has been a proliferation of sugar cane growers who, based on the year-round water demand of the crop incorporated into the PCR, are being allocated significant volumes of water at the expense of farmers who have other less water-intensive crops, who do not receive any water during periods of low water levels in the reservoirs. Hence, the PCR does not provide an incentive for efficient or equitable use of water (Hendriks, 2011).

In the south of Peru many of the water user boards (of which there are 112 in the country each with between 50 and 60,000 farmers) have not accepted the PCR and have used proportional allocation of available water according to irrigation areas independent of the type of crop. This is a simpler system that does not require complex calculations to compare total demands of individual crops versus availability with the physical infrastructure for water distribution is relatively fixed, and it is considered more equitable (even if landownership is very unequal). Under this system the risk of water scarcity is transferred to the producers who in turn seek to increase the efficiency of their individual crops. In the northern coast of Peru where allocation is done using the PCR, the boards spend a significant portion of

¹ These reforms were preceded by the creation of PROFODUA (Programa de Formalización de Derechos de Uso de Agua - Program to Formalize Rights to Use Water) in 2004, through which water rights were granted individually and in blocs thus avoiding the use of the term 'collective right'. These water rights could be traded or exchanged creating the conditions for a market of water rights to emerge (Vera-Delgado and Vincent, 2013).

their resources on funding personnel required to administer a sophisticated distribution system. This leaves them with insufficient resources to pay for transportation and office space. In contrast in the south, the boards, even with less area and volumes of water to distribute, have enough resources to invest in capital such as trucks for the technicians who distribute the water, and office space (Hendriks, 2011). In the Andean region of Peru, there are other examples of water distribution systems that have built seasonal reservoirs which operate on a more equitable and efficient basis. One of these systems allocates water stored in reservoirs to individual families with an amount sufficient to irrigate approximately 1/3 of a hectare, independently of the size of the family and without considering other water sources that individual families may access (Hendriks, 2011).

Nationally, water allocation is charged according to the economic sector, with the industrial sector paying around US\$0.0216/m³, followed by mining (US\$0.015/m³), domestic (US\$0.0051/m³) and agriculture (between US\$0.0004 and 0.001/m³). In comparison, hydroelectricity generators pay 1% of the cost of energy generation. According to Hendriks (2011) there is no disclosure of the amount of money that the government receives from licence fees. Approximately 70% of irrigation farmers in the coastal region and most of large potable water systems pay water fees. In the Andean region, most registered water users pay the fees, although most water users are not registered. It is known that in some cases water users have been persuaded to make payments to the local water authority with the argument that fees are a way to secure a water licence they have not registered. With this pressure, unregistered users pay a fee impacting their capacity to fund their own operations.

For over a decade, the national water authority has maintained that the mining sector uses 2% of the total consumptive water, even after the sharp increase in mining concessions of the last few years (Hendriks, 2011). This is in part due to the lack of monitoring or control over licences and actual use of water by mining operations. Hendriks notes licences for 120 l/s that use between 250 and 300 l/s. These companies are paying fees on the registered amount and not on their actual water use.

Peru is a case where the paradigm of efficiency has deeply penetrated water allocation and where equity and sustainability principles are largely ignored through weak definitions and a lack of implementation mechanisms. In contrast, the efficiency discourse is widely developed in all water rules, and diverse instruments of technical and allocative efficiency have been put in place across economic sectors and between different types of users. The reform of the legal framework for water has been dominated by hegemonic economic groups (Roa-García et al., in press). Small and marginalised water users are being severely impacted by efficiency instruments that are, to a large extent, mechanisms of water plundering.

TRADE-OFFS BETWEEN EQUITY, EFFICIENCY AND SUSTAINABILITY

In this section I will ponder on the intrinsic meaning that each of the three principles has been given in each country and evaluate the trade-offs made between them.

Equity

The three countries have prioritised water for domestic human use above all other uses. As can be seen in Table 2, addressing distributive justice all countries have explicitly stated the decision to satisfy human needs before any other water demand. However, interesting differences are seen across countries. In Colombia, in addition to the prioritisation given to domestic and agricultural uses, community use is prioritised over individual use. However, the same water code establishes that environmental authorities can alter the prioritisation and can impose restrictions or expropriate water for a list of purposes, rendering the prioritisation ineffective. Of the three countries Ecuador has incorporated the most ambitious legal changes moving beyond prioritisation based on needs, to the prioritisation of food sovereignty following domestic use, and to the aspiration for a complete reallocation of water rights to improve equity in access. The constitutional reform however was solely a

point of departure, and this reform together with the mandate for a new water law remain unfulfilled. Based on the prioritisation for water allocation in the three countries the focus of distributive justice has been on needs more than on any notion of equity. In fact, the human right to water in these countries has supported the prioritisation of water to cover basic human needs. However the human right to water discourse has had a limited influence in debates around decision-making processes. The special attention that the human right to water has given to domestic water has been detrimental to broader approaches to water justice (Goff and Crow, 2014).

Table 2. Prioritisation in water allocation.

Colombia Water code, 1978	Ecuador Constitution, 2008	Peru Water law, 2009
Order or priority: collective or communal human consumption (urban or rural); individual human consumption; community agriculture (including aquaculture and fishing); individual agriculture (including aquaculture and fishing); generation of hydroelectricity; industry or manufacturing; mining; collective recreation; individual recreation (Art. 41). The environmental authority can change the order or priority for granting concessions or permits, and can impose restrictions or expropriate for purposes related to irrigation, flood control, water, soils and watershed conservation, water and energy supply among others (Art. 123).	1. Water for domestic use 2. Irrigation for food sovereignty 3. Ecological flows 4. Productive activities 5. Large landholdings, water accumulation and privatisation are prohibited.	1. Water for satisfying primary human needs is prioritised since it is a human right above all other uses, even in times of scarcity (Art. 3). Use for satisfying primary human needs; population use 2. Productive use (Art. 35). Productive activities are ranked in order: Agriculture (crops and animals); aquaculture and fishing; energy; industrial; medicinal; mining; recreational; touristic; transportation (Art. 43).

In the context of procedural justice none of the three countries have made water allocation participatory (see Table 3). In Colombia, watershed councils still concentrate all decision-making power with environmental authorities and participation in concession granting is limited to the opportunity to challenge a decision. In Peru, indigenous communities were not consulted during the drafting of the water law despite the considerable impact that the norm is having on their access to concessions and the fact that Peru had ratified the ILO 169 agreement. And in Ecuador, as described in section 2, the constitutional court disregarded CONAIE's plea for prior consultation with respect to the 2009 mining law that potentially has a significant impact on water. Having ratified the ILO 169 agreement the three countries are expected to perform a prior consultation (that, in some instances, is interpreted as a free and informed prior consent) before a) the adoption of legislative or administrative decisions, b) the formulation, application and evaluation of national or regional plans or programmes, and c) the authorisation for exploration and exploitation of resources in indigenous territories (Art. 6, 7 and 15 of the agreement). But to date there have only been a few cases in Colombia where the constitutional court has ruled in favour of local communities when prior consultation has not been carried out or when it has not been conducted in accordance with the law (Rodríguez-Garavito, 2012).

Table 3. Participation in decision making on water allocation.

Colombia Water Code, 1978	Ecuador Constitution, 2008	Peru Water Law, 2009
Water users can oppose the request of a concession by another water user	CONAIE requested the mining law (2009) to be declared unconstitutional	Decisions about concessions and licences are restricted to the National Water Authority (ANA)
Only environmental authorities can make decisions about watershed management plans designed by watershed councils	Constitutional court endorsed the law arguing the urgency of the law and granting the national assembly the power to decide on constitutionality in cases of uncertainty	Watershed councils can be consulted
All three countries have ratified the ILO 169 Agreement recognising the right of indigenous communities to be consulted and provide consent for projects with negative impact potential		

Equity has gained some space reflected in the prioritisation in water allocation, particularly in Ecuador and Colombia, where explicit priorities are given to food sovereignty and community irrigation over any large-scale productive activities. However, equity remains a secondary goal as demonstrated by the lack of mechanisms of enforcement and by the ultimate decision-making mechanisms that despite much rhetoric, remain in the hands of governments. In Peru, the goal of equity in water access is reduced to a utilitarian approach for the implementation of tariffs for water and sanitation provision; and social equity in water is addressed through a policy that allows access to the service to the largest number of people, disregarding the human right to water for all and the protection of the most vulnerable groups of society. A summary of the contradictions in water policies related to equity goals is given in Table 4.

Based on equity considerations, water allocation in these countries has limited legitimacy. The lack of transparency in the allocation process in Colombia and the oversight of traditional forms of allocating water in Peru vitiate the legitimacy of governmental decisions. Within Ecuador, legitimacy will be decided if and how the constitutional reforms on water are operationalised.

Efficiency

In the cases analysed here, there are at least three types of efficiency with distinct policies. Technical efficiency, which in its capped conception is reflected in policies related to the reduction of losses in water distribution. These policies have a true ceiling (100% efficiency) and most commonly an efficiency benchmark goal over which further savings (efficiency) are extremely hard to reach. This notion of efficiency, referred to as capped technical efficiency, does not conflict with any other goal, as its confinement within the physical properties of water, makes it a reasonable goal for all users and does not portray a false sense of water abundance that would encourage unsustainable water use. The Colombian law of water savings and efficient use insinuate a capped technical efficiency goal by stating that any individual use should not exceed the necessary amount to achieve that use, establishing goals for reducing water loss in distribution, commanding the reuse of water when possible and the installation of water use metering devices. The components of this law seek to set up normative benchmarks (Malghan, 2010) to aim at minimising water use for individual activities, in line with the capped conception of technical efficiency. One limitation of this law is the delegation of actual efficiency benchmarks to environmental authorities characterised by poor technical capabilities, and ridden by clientelism and corruption.

Table 4. Manifestations of the struggle over equity in water allocation.

Obstacles for equity on water allocation		
Colombia Water Code, 1978	Ecuador Water Law 1972, Agrarian Reform, 1997	Peru Water Law rules, 2010
<ul style="list-style-type: none"> • Onerous requisites for water rights • Limited capacity of authorities • Discretion in decision making • 70% small users do not have water rights 	<ul style="list-style-type: none"> • Water rights proportional to land • 1% landowners with 64% water allocated 	<ul style="list-style-type: none"> • Communities are required to formalise their rights using bloc licences and registering individual water users with fixed amounts of water
Drivers of equity in water allocation		
Colombia Water Code, 1978	Ecuador Constitution, 2008	Peru Water Law, 2009
<ul style="list-style-type: none"> • Potable water as a social right • Healthy environment as collective and environmental rights • Active constitutional court defending the human right to water (since 2003) 	<ul style="list-style-type: none"> • Redistribution for equitable water rights, food sovereignty (two years) • Human right to water 	<ul style="list-style-type: none"> • The state respects uses and customs of peasant and indigenous communities and their right to use water in their territories
<i>Summary</i>		
Discriminatory water rights but active constitutional court	Strong emphasis on equity but aspirational	Inconsistent legislation

Another notion of technical efficiency is reflected in policies such as the Peruvian efficiency certificates. The policy of efficiency certificates does not define the expected efficiency gains that would be rewarded with the certificates, and their lack of indication of a ceiling for water use efficiency points towards the notion of ever increasing water savings, or increases in output per water unit. This type of efficiency, referred to as uncapped technical efficiency, conflicts with sustainability goals, as per the rewards that the policy promises (the water saved through this policy will be allocated to efficiency certificate holders). This policy leads to increased water use through assumed (theoretical) efficiency gains, similarly to what has been found in Spain (Gómez-Gómez, 2009).

For every productive activity there is, in theory, a minimum amount of water required to obtain the maximum yield of crop, mineral extraction, power, etc. The regulations governing these water laws specify neither minimum water requirements nor maximum yields (caps) promoting the idea of unlimited efficiency. The implicit uncapped efficiency notion in these norms produces two effects. On the one hand, it promotes the idea that production can grow indefinitely through investments in technology, although in many cases the new technologies (particularly for irrigation) may actually be less efficient (de Vos, 2013). On the other hand, it contributes to strengthening unbalanced power relations by deploying efficiency improvements as a neutral problem-solving instrument when, in fact, it is a value-loaded concept promoted by policy makers (Boelens and Vos, 2012). Thus, the notion of

uncapped efficiency conflicts with maintaining water use within the renewable capacity of ecosystems (sustainability) and with the protection of vulnerable groups of society (equity).

Third, allocative efficiency conflicts with equity goals. A policy such as the Peruvian allocation of water within the same productive use to the most efficient users and the largest employment generators creates a further gap between large landowners and small and indigenous water users.

Fees charged for water concessions in the three countries are not providing allocative efficiency incentives. In contrast, they reflect more an interest to charge water according to the profitability of the respective activity, proportionally to their capacity to pay (cases of Colombia and Peru) or a notion of equity (Ecuador). Industrial and mining operations pay more for water concessions in Peru than domestic and agricultural users. This policy has had regressive effects on equity in the three countries since those grantees that pay more for their concessions are favoured over those who pay less or do not pay.

Table 5 summarises key examples of water efficiency policies in the three countries: Peru emphasising allocative and uncapped technical efficiency, Colombia focused on capped technical efficiency, and Ecuador having no practical application of efficiency within its water laws.

Table 5. Efficiency in water allocation.

Colombia Water Efficiency Law, 1997	Ecuador Constitution, 2008	Peru Water Law, 2009
Formal water users → programme of efficient use and water savings	Efficiency paired with other principles such as equity, sustainability, precaution and prevention	Within the same productive use: <ul style="list-style-type: none"> • Highest efficiency • Highest income generator Certificates of efficiency
<i>Summary</i>		
Capped and uncapped technical efficiency	No practical application of the term Unspecified notion of efficiency	Strong emphasis on allocative efficiency and uncapped technical efficiency

Sustainability

Attempts at limiting the scale of human appropriation of water have been weak and slow. A summary of sustainability within water allocation rules is provided in Table 6. Ecuador has incorporated innovative and ambitious instruments into the constitution including development within the regenerative capacity of ecosystems, and the rights of nature; however, Ecuador lacks practical instruments for implementation of constitutional reforms. Colombia has incorporated extreme measures since 1978 where streams can be declared closed when concessions granted reach or exceed the available water flow. In Peru, the restriction of water allocation and use is based on the maintenance of ecological flows, a concept that has been included in the water law but not regulated as yet.

The development of policies to maintain the rate of water use within sustainable boundaries is limited. Ecological economists have recognised the importance of solving sustainability and equity issues before prioritising efficiency goals; but they have also acknowledged that under current global trading arrangements, any country that elected to adopt sustainable resource use and equity goals would be disadvantaged in a competitive sense (Lawn, 2007). The logic of individual freedom and

maximum economic returns proves perverse when confronted with the societal goals of sustainability and equity.

Table 6. Sustainability (scale) of water allocation.

Colombia Water Code, 1978	Ecuador Constitution, 2008	Peru Water Law, 2009
<ul style="list-style-type: none"> • Declaration of water source closure: when the total of concessions granted reach or exceed the available water flow • Based on scarcity index and ecological flows (Resolution 865 of 2004) 	<ul style="list-style-type: none"> • Principle of good living (<i>buen vivir</i>): the state will guarantee development within regenerative capacity of ecosystems • Responsible for planning and managing water for 1) human use; 2) food sovereignty; 3) ecological flows • Rights of nature 	<ul style="list-style-type: none"> • Conditions for granting water rights: the source should have enough water to guarantee ecological flows, minimum levels of reserves or navigational conditions
<i>Summary</i>		
<ul style="list-style-type: none"> • Water rights restrictions • Defined scarcity index and ecological flows but not operational 	<ul style="list-style-type: none"> • Innovative tools for keeping water use within a sustainable scale • Not related to water rights 	<ul style="list-style-type: none"> • Water rights conditioned to ecological flows • Instrument not defined

Many of the recent reforms on water laws that stress equity and sustainability have originated from social movements that base their arguments not on the balance between equity, efficiency and sustainability principles, but on a paradigm shift towards an integration of nature and culture (Roa-García et al., in press). Indeed equity principles are based on an indistinct separation of individual and community; and sustainability principles are based on the coalescence between nature, culture and society.

CONCLUSIONS

Conflicts between water users are increasing, making evident the lack of a judicious, balanced and transparent procedure for water allocation in regions where demand comes from users with a wide range of needs and different levels of power, and where human appropriation of water is reaching unsustainable levels. While no definitions of equity, efficiency or sustainability are included in Andean water laws, their meaning is implicit. The three countries balance these principles without defining them. In all countries, a lack of public participation in how decisions are made characterises water allocation decision making, which is the most basic form of inequality. In norms or in practice, decision making is limited to the state, which in most cases protects private interests at the expense of sustainability and equity goals.

Equality and need rather than equity has been used as the guiding principle for water allocation and access, and find their expression in the human right to water. In the name of equality the human right to water has not addressed equity concerns. The notion of equity, which includes the right to participate in decision making, is marginally used to guide norms for water allocation. In Colombia and Peru, equity in water allocation is not pursued through any legal tools.

Water allocation mechanisms appear disjointed in the three countries. The weight that each principle has been given in the law reflects the prioritisation given: to equity in Ecuador, to allocative efficiency in Peru and to the independence of the state to make decisions in water allocation in Colombia. The principle of distributive justice (fairness) is expressed in the three countries but they lack implementation and oversight mechanisms. Procedural justice (participation) is expressed in Colombia and Peru through watershed councils and in the ratification of the ILO 169 agreement by the three countries providing prior consultation to ethnic minorities. However, final decisions are still concentrated in national or regional authorities. Allocative efficiency (economic output) is highly pursued in Peru. In Colombia, efficiency is defined in technical terms, but the designation of efficiency caps (ceilings) and decision making remain concentrated within environmental authorities. In Ecuador, efficiency is mentioned but not developed as a principle for water allocation.

Ecological economists have stressed the importance of working simultaneously on the three separate goals regarding the allocation of scarce resources: equity, efficiency and sustainability (Daly, 1991, 1992; Lawn, 2004, 2007; Malghan, 2010). Equity, efficiency and more recently sustainability represent societal goals that are in conflict in the Andes. The laws and norms that regulate water allocation and their compliance in the Andean countries mirror the tension between models of society that represent conflicting value systems and raise the question of the compatibility of these principles. Inserted to varying degrees in the global economy, the countries in the region have adopted the values or goals of equity, efficiency and sustainability in allocation as water is recognised as one of the most basic conditions for life. Equity has been given a surrogate role losing its priority as a critical factor in the search for more just societies. Despite the intentions of constitutions and laws to achieve equity in water access, the prevailing political economy of water favours efficiency at the expense of equity. With water as with land, efficiency in allocation has taken priority over equity and sustainability, producing greater inequality and contributing to making Latin America the most unequal region in the world.

Water laws in these three countries indicate: 1) that while efficiency has become the bastion of neo-liberalisation, equity and sustainability principles are either neglected or have become subsidiary; 2) that implicit definitions of equity fall short in promoting the interests of the disadvantaged; and 3) that the complex definition, measurement and monitoring of what constitutes a sustainable scale of human water use, makes it an impractical goal.

Trade-offs in water allocation principles are similar to other global challenges such as climate change. Climate talks in the global arena revolve around the total capacity of the atmosphere to receive carbon emissions (sustainability), the right of developing countries to use the atmosphere as a sink for their emissions versus developed countries that have a larger share (equity), and the projects/technologies that produce the most value/energy/output with the least amount of emissions (efficiency). However, just like in climate talks, a balanced state between these three goals seems unachievable. When compared with legal instruments, incentives and narratives for efficiency, equity and sustainability appear insignificant.

This article exemplified the failure in achieving trade-offs between the goals of equity, efficiency and sustainability in order to remain within a sustainable scale and attain social justice for irreplaceable 'goods' such as water. Achieving a balance between equity, efficiency and sustainability appears unrealistic within the current paradigm. This is increasingly suggesting the need to remove efficiency from this triad of principles in water allocation and make it an important but subsidiary tool to sustainability and equity.

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